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ENVIRONMENTAL ISSUES GUIDE CONCEPT PLAN METHODOLOGY
INVESTIGATION(U) ARMY TROPIC TEST CENTER APO MIAMI
34884 R L WILLIAMSON JAN 83 USATTC-838182

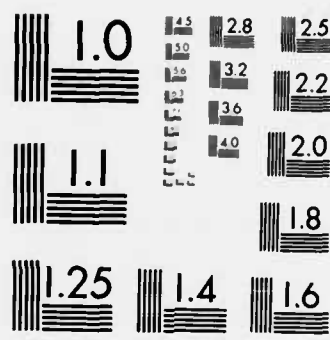
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AD No. _____

TECOM Project No. 7 CO PB1-TT1-001

USATTC Report No. 830102

RDTE No. _____

ADA 128183

METHODOLOGY INVESTIGATION
FINAL REPORT
ENVIRONMENTAL ISSUES GUIDE CONCEPT PLAN

by

Roger L. Williamson

January 1983

Approved for public release, distribution unlimited.

UNITED STATES ARMY TROPIC TEST CENTER

APO MIAMI 34004

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| 1. REPORT NUMBER TECOM Project No. 7-CO-PB1-TT1-001 | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE (and Subtitle) Methodology Investigation Final Report Environmental Issues Guide Concept Plan | | 5. TYPE OF REPORT & PERIOD COVERED Final Report October 1981 to November 1982 |
| 7. AUTHOR(s) Roger L. Williamson | | 6. PERFORMING ORG. REPORT NUMBER USATTC Report No. 830102 |
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| Data Storage Systems | Materiel | Test Methods |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) | | |
| <p>A data matrix approach was used to structure the currently undefined population of environmentally related materiel system design and testing issues. The basic matrix is defined by 4 Environmental Regions, 40 Capability Categories (CATPLAN), 10 Issue Areas, and 40 Environmental Factors. Each of the resulting 64,000 cells of the matrix has the potential to contain at least one issue. Information on issues and implications for system design are included in cell data design. The benefit of this guide extends beyond tropic</p> | | |

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testers to include designers, testers, and evaluators for all military systems in all environments. The concept is now being implemented for DOD-wide use by the US Army Engineer Topographic Laboratories,

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FOREWORD

The need for an environmental issues guide was surfaced by Dr. Delaney A. Dobbins, Headquarters (HQ), US Army Test and Evaluation Command (TECOM). The concept presented in this report was conceived by the author with helpful ideas coming from personnel at HQ, TECOM, US Army Tropic Test Center (USATTC), and members of the Institute of Environmental Sciences.

SECTION I. SUMMARY

1.1 BACKGROUND

a. In 1980, USATTC recognized the need for a systematic approach to the process of identifying Army materiel design and test issues related to operating Army materiel systems in various types of climates throughout the world. USATTC submitted a 2-year Methodology Improvement Proposal (Appendix A) to TECOM. The purpose of the investigation was to develop an environmental issues guide for humid tropic testing (EIGHT). The first year covered the concept development stage; the second year was to be the application stage. That proposal was approved and funded for work during fiscal year (FY) 1981. During FY81, the concept was formulated and finalized. No work was performed in FY82 because the investigation was not funded that year.

b. In 1981, the concept for EIGHT was coordinated with the US Army Engineer Topographic Laboratories (ETL) which had been tasked by the Defense Materials Specifications and Standards Office (DMSSO) to develop a new Department of Defense (DOD) Military Handbook (MIL-HDBK-XXX) with goals similar to those of the EIGHT investigation (reference 1). ETL implemented the EIGHT concept plan to carry out their MIL-HDBK-XXX project (reference 2). Because the concept is now being implemented by ETL, and because the USATTC testing workload for FY83 will not allow the Center to complete the project locally, the EIGHT investigation was not funded for FY83. The decision was made by HQ, TECOM to have USATTC prepare a methodology investigation report based on the concept only. Therefore, an original objective to prepare a Test Operations Procedure based on the results of this investigation (see Appendix A) is not included in the objectives below.

1.2 OBJECTIVES

a. Develop an environmental issues guide for humid tropic testing, identifying salient climatic issues to be considered when preparing Independent Evaluation Plans/Test Design Plans (IEP/TDPs) and when attending Test Integration Working Groups (TIWGs) and In-Process Reviews (IPRs).

b. Devise an overall framework that will help to identify areas of needed test methodology improvement and necessary tropic research.

1.3 SUMMARY OF PROCEDURES

a. To take advantage of modern, computerized data management system methods, a data matrix approach was used to structure the currently undefined population of tropic related issues. To make the tropic issue structure compatible with a structure that should be common for all types of environments, a larger task of developing a concept that would encompass all environments was undertaken.

b. To identify basic dimensions of an issues matrix that would be useful and familiar to TECOM and other Army users, structures now used by the Army to categorize materiel systems and to structure the materiel design and testing process were reviewed and analyzed. Also, papers prepared by Army organizations on the structure of environmental factors were reviewed (reference 3).

c. Various possible basic dimensions of an issues matrix were reviewed and evaluated by selected DOD and Institute of Environmental Science personnel involved in system design and testing. A matrix that combined the views of the evaluators was used as the framework for the EIGHT project.

1.4 SUMMARY OF RESULTS

a. Basically, the concept for the environmental issues guide is in the form of a matrix defined by 4 Environmental Regions, 40 Capability Categories (CAPCATS), 10 Issue Areas, and 40 Environmental Factors. Each of the resulting 64,000 cells of the matrix has the potential to contain at least one issue.

b. The matrix, when operational, would serve two purposes. The first, an issue finder matrix, would state if there were an issue connected with a specific cell. For instance: In the humid tropics (1 of 4 environmental regions), does vegetation (1 of 40 environmental factors) affect the operability (1 of 10 issue areas) of a tank (1 of 40 CAPCATS)? The cell defined by this question could contain one or more critical issues, other issue, or no issue at all.

c. A second, parallel matrix would contain the exact wordings of any issues that would be discovered to exist in a given cell. Also included in the cell of a second matrix, or in the corresponding cell of a third parallel matrix, would be data on issues in that cell plus any design implications for that cell.

1.5 ANALYSIS

a. It is impossible for every design engineer, test officer, and system evaluator to remember what environmental factors may degrade various kinds of systems in various environmental regions. It is equally unlikely that such persons would know the manners in which the factors may degrade system effectiveness. This guide would fill the need for corporate structure and memory regarding questions that need to be asked throughout a materiel system's Research, Development, Test, and Evaluation (RDTE) cycle. In addition, management personnel would have a tool for identifying gaps in design and test capabilities, for structuring improvement programs, for tracking accomplishments, and for discussing the highly complex pool of questions that this guide would organize. Development of the first portion of the guide, the issue finder matrix, would be a short-range goal that could be achieved within a year or two. Inputting issue statements, data, and other information to developers into a second matrix would be longer range goals. The

entire guide (issue and answer matrices) could be stored, updated, and retrieved via a reasonably simple, easily indexed computerized system.

b. The stated goal of this methodology investigation was limited to developing an issues guide for testing Army systems in the humid tropics. However, efforts to structure the larger picture into which tropic testing fits were necessary to avoid the pitfall of developing a limited structure to which the whole picture could not relate. As explained in the background section of this report, the overall concept is now being used as the basis for DOD MIL-HDBK-XXX. Therefore, the benefit from this investigation is multiplied beyond serving as a guide to tropic testers, to include designers, testers, and evaluators for all military systems in all environments.

1.6 CONCLUSIONS

a. A computerized issues guide for humid tropic testing can be developed. The concept outlined in this report provides a means for identifying issues to be considered when preparing IEP/TDPs and when attending TIWGs and IPRs.

b. The concept plan provides an overall framework that can help to identify areas of needed methodology improvement and tropic research.

1.7 RECOMMENDATION

USATTC and other TECOM Installations/Field Operating Activities support ETL to the fullest extent possible in their efforts to implement this concept plan.

SECTION 2. DETAILS OF INVESTIGATION

2.1 NEED FOR ENVIRONMENTAL ISSUES GUIDE

There is no comprehensive, systematic approach for identifying environmental issues relating to testing and evaluating Army systems for stating the issues in system requirements documents, system design documents, nor test planning documents; nor discussing such issues during system design/test integration working groups nor materiel acquisition review boards. Materiel acquisition managers and project officers need a reference document to help determine what factors may degrade various systems in various environments so that these factors will be considered in system design and testing. Systems analysis personnel need a consistent, systematic tool to help meld their operations research and test design capabilities with technical aspects of environmental design and testing, and with scientific aspects of environmentally induced system effectiveness problems.

2.2 ORGANIZATION OF THE GUIDE

a. Basic Organization. Basically, the concept for the guide is a matrix defined by Environmental Regions, Capability Categories (CAPCATS), Issue Areas, and Environmental Factors, as shown in table 1. Specific levels of those dimensions are detailed in table 2. The dimensions and levels were taken from structures and terms currently in use in the Army RDTE community (reference 2). Table 1 shows a potential of 64,000 kinds of issues that may exist, one set of issues for each cell of the basic matrix. A detailed portion of the matrix is shown in table 3.

b. Issue Finder Matrix. The first section of the issues guide would be a detailed matrix (such as the sample shown in table 3) that would specify the degree to which each cell is an issue. The "issue finder matrix" would allow design or test personnel who may want to know, for instance, what environmental factors influence the operability of a tank in the tropics, to search for the appropriate issue finder cell set (Region = Tropic, CAPCAT = Tank; Issue Area = Operability) and examine the "issue finder ratings" for the forty environmental factors. It is emphasized here that the ratings shown in Table 3 were assigned hastily by a single person to serve as examples of how the issue finder matrix would work. Final ratings would have to be determined, at the very least, by teams of experts in the four environmental regions. The ratings would answer questions regarding the degree to which an environmental factor is important.

c. Issue/Data Matrix. The next step in the search for issues could be to ask, for instance, "So, what does vegetation have to do with the operability of a tank in the tropics?" The answer would be found via the "issue/data references" next to the issue finder ratings on table 3. Each of the issue/data references is constructed from the levels of the four dimensions of the basic matrix. The references are established in the order of: Environmental Region (e.g., Tropic = 1); CAPCAT (e.g., Tank = 01); Issue Area (e.g., Operability = 01); and Environmental Factor (e.g., Vegetation = 04).

For the example with which we are working, the issue/data reference number would be 1010104. Therefore, each of the 64,000 cells of the basic matrix has an issue finder rating and a reference number. The reference number is an index to a parallel matrix that would contain issue statements, data, and design information. Table 4 shows examples of the types of information that would be found in the parallel matrix. The search for "issues and answers" for our sample problem, the effect of vegetation on operating a tank in the tropics, would bring us very quickly to cell 1010104 where a number of issues would be worded clearly, where data on the problem would be summarized, and where implications for the designer could be stored.

TABLE 1. ENVIRONMENTAL ISSUES GUIDE: BASIC ISSUE FINDER MATRIX

| | | | | |
|-----------------------|--|-----------|---------------------|---------------------|
| Environmental Region: | | 1 | ... | 4 |
| Capability Category: | | 1 | 2 ... 40 | 1 2 ... 40 |
| Issue Area: | | 1,2,...10 | 1,2,...10 1,2,...10 | 1,2,...10 1,2,...10 |

Environmental Factors

Natural

Terrain: 4
Climatic: 10
Biological: 2

See Table 3 for details of this portion of matrix.

Induced

Airborne: 2
Mechanical: 3
Energy: 3

Constructed

Physical: 4
Psychological: 3

Combat Peculiar:

Permanent: 2
Persistent: 2
Transitory: 5

Total No. Factors = 40

Basic Matrix

4 Environmental Regions
40 Capability Categories
10 Issue Areas
40 Environmental Factors

64K Total No. Cells

TABLE 2. LEVELS OF MATRIX DIMENSIONS

| <u>Environmental Factors</u> | | | |
|--|----------------------|--|------------------------|
| <u>Natural</u> | <u>Wind</u> | <u>Energy</u> | <u>Combat Peculiar</u> |
| Terrain | Salt | Acoustic | Permanent |
| Topography | Biological | EMR | Field Fort |
| Hydrology | Macro- | Nuclear Rad | Barriers |
| Soils | Micro- | <u>Constructed</u> | Persistent |
| Vegetation | <u>Induced</u> | <u>Physical</u> | NBC |
| Climatic | Airborne | Built-up Areas | Debris |
| Temperature | Sand-Dust | Transportation | Transitory |
| Humidity | Pollutants | Communications | NBC |
| Pressure | Mechanical | Energy | Fire |
| Solar | Vibration | Psychological | Electronic Em |
| Rain | Shock | Cognitive | Illumination |
| Snow | Acceleration | Affective | Obscuration |
| Ice | | Behavioral | |
| Fog | | | |
| <u>Capability Categories (CAPCATS)</u> | | | |
| <u>Close Combat</u> | | <u>Command Systems</u> | |
| Tank | | Strategic Communications | |
| Anti-Tank | | Tactical Communications | |
| Combat Aviation | | COMSEC | |
| Mech | | Automation | |
| Light Weapons | | Position Location | |
| Other | | Other | |
| <u>Fire Support</u> | | <u>Intelligence, Surveillance, and</u> | |
| Mortars | | <u>Target Acquisition</u> | |
| Cannon Artillery | | EW | |
| Rocket/Missiles | | Strategic Intelligence | |
| Support | | RSTA | |
| <u>Air Defense</u> | | <u>Combat Service Support</u> | |
| Low Altitude Systems | | Supply and Transportation | |
| Low/Medium Altitude Systems | | Maintenance | |
| Medium/High Altitude Systems | | Medical | |
| Support | | Energy | |
| <u>Other Combat Support</u> | | Aviation | |
| Combat Engineer | | Other | |
| Mine/Countermine | | <u>Other Logistics</u> | |
| Night/Observation (non-system) | | Construction | |
| NBC | | Admin Aviation | |
| Other | | Admin Vehicles | |
| <u>Ballistic Missile Defense</u> | | Other | |
| | | <u>Overall Testing Support</u> | |
| <u>Environmental Regions</u> | | | |
| <u>Tropic</u> | <u>Desert</u> | <u>Cold</u> | <u>Temperate</u> |
| | | | |
| <u>Issue Areas</u> | | | |
| <u>Operability</u> | <u>Vulnerability</u> | <u>Safety</u> | <u>Survivability</u> |
| Reliability | Availability | Maintainability | Transportability |
| Mobility | Fightability | | |

TABLE 3. DETAILED PORTION OF ISSUE FINDER MATRIX

Environmental Region: (1) TropicCapability Category: (01) Tank

| Environmental Factors (Class/Type/Factor) | Issues Area | | | | | |
|---|----------------------------|-------------------------|----------------------------|-------------------------|----------------------------|-------------------------|
| | Operability (01) | | Vulnerability (02) | | Safety (03) | |
| | Issue Finder Rating* | Issue/ Data Ref** | Issue Finder Rating* | Issue/ Data Ref** | Issue Finder Rating* | Issue/ Data Ref** |
| <u>Natural</u> | | | | | | |
| Terrain | | | | | | |
| Topography (01) | 3 | 1010101 | 0 | 1010201 | 2 | 1010301 |
| Hydrology (02) | 3 | 1010102 | 0 | 1010202 | 1 | 1010302 |
| Soils (03) | 2 | 1010103 | 3 | 1010203 | 2 | 1010303 |
| Vegetation (04) | 3 | 1010104 | 2 | 1010204 | 2 | 1010304 |
| Climatic | | | | | | |
| Temperature (05) | 2 | 1010105 | 2 | 1010205 | 3 | 1010305 |
| Humidity (06) | 2 | 1010106 | 2 | 1010206 | 2 | 1010306 |
| Pressure (07) | 0 | 1010107 | 0 | 1010207 | 0 | 1010307 |
| Solar Rad (08) | 2 | 1010108 | 0 | 1010208 | 2 | 1010308 |
| Rain (09) | 3 | 1010109 | 3 | 1010209 | 0 | 1010309 |
| Snow (10) | 0 | 1010110 | 0 | 1010210 | 0 | 1010310 |
| Ice (11) | 0 | 1010111 | 0 | 1010211 | 0 | 1010311 |
| Fog (12) | 3 | 1010112 | 2 | 1010212 | 2 | 1010312 |
| Wind (13) | 1 | 1010113 | 0 | 1010213 | 1 | 1010313 |
| Salt (14) | 0 | 1010114 | 0 | 1010214 | 1 | 1010314 |
| Biological | | | | | | |
| Macro (15) | 0 | 1010115 | 0 | 1010215 | 0 | 1010315 |
| Micro (16) | 0 | 1010116 | 0 | 1010216 | 1 | 1010316 |

* Rating: 0 = Not important
 1 = Minor (indirect factors)
 2 = Major (direct factors)
 3 = Critical (crucial factors)

** Issue/Data Reference: Region/CAPCAT/Issue Area/Environmental Factor

TABLE 4. SAMPLE ISSUE/DATA MATRIX CELL CONTENT

| | | |
|-----------------------|-------------|------|
| Environmental region: | Tropic | (1) |
| Capability Category: | Tank | (01) |
| Issue Area: | Operability | (01) |
| Environmental Factor: | Vegetation | (04) |

Issue Statements:

1. Does tropic vegetation obscure the driver's vision to the point of not being able to maneuver effectively?

a. Data:

b. Design Implications:

2. Do tropic dry season vegetation fragments clog engine or compartment air intake ports?

a. Data:

b. Design Implications:

SECTION 3. APPENDIXES

APPENDIX A. TEST DIRECTIVE AND METHODOLOGY INVESTIGATION PROPOSAL

(COPY)

Mrs. Testerman
AUTOVON 283-2170

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

DRSTE-AD-M

SUBJECT: Directive, Environmental Issues Guide for Humid Tropic Testing,
TRMS No. 7-CO-PB1-TT1-001

Commander
US Army Tropic Test Center
ATTN: STETC-TD-0
APO Miami 34004

1. References:

- a. TECOM Regulation 70-12, dated 1 June 1973.
- b. AR 700-90, Change 1, 10 March 1977.

2. This letter and attached STE Forms 1188 and 1189 (Inclosure 1) constitute a directive for the subject investigation under the TECOM Methodology Improvement Program BP 5397-5071.

3. The MIP at Inclosure 2 is the basis for headquarters approval of the subject investigation.

4. Special Instructions:

a. All reporting will be in consonance with paragraph 9 of reference 1a. The final report, when applicable, will be submitted to this headquarters, ATTN: DRSTE-AD-M, in consonance with Test Event 53, STE Form 1189.

b. Semi-Annual Project Status Reports RCS-DRCMT-301, Manufacturing Technology (MANTECH) Program, are to be provided to this headquarters by 15 June and 15 December for each year that the investigation is active. The information contained in the RCS-301 Report is entered into a data bank by the Industrial Base Activity (IBEA), Rock Island, Illinois, and used by DARCOM

DRSTE-AD-M

SUBJECT: Directive, Environmental Issues Guide for Humid Tropic Testing,
TRMS No. 7-CO-PB1-TT1-001

to monitor the progress of the program. Therefore, the information must be provided in the exact format shown at Inclosure 3. If the investigation is supported with funds for more than 1 fiscal year, it must be reported for each year.

c. Recommendations of new TOPs or revisions to existing TOPs will be included as part of the recommendation section of the final report. Final decision on the scope of the TOP effort will be made by this headquarters as part of the report approval process.

d. The addressee will determine whether any classified information is involved and will assure that proper security measures are taken when appropriate.

e. Upon receipt of this directive, test milestone schedules will be immediately reviewed in light of known other workload and projected available resources in accordance with provisions of paragraph 2-4 to TECOM Regulation 70-8. If rescheduling is necessary, this headquarters, ATTN: DRSTE-T0-0 will be notified by 1st Indorsement not later than 15 December 1980. If schedules can be met, a P8 entry will be made directly into the TRMS master file by that date.

f. The Methodology Improvement Division technical point-of-contact is Mr. Grover H. Shelton, ATTN: DRSTE-AD-M, AUTOVON 283-2170/2375. Financial and reporting point-of-contact for subject investigation is Mrs. Lois J. Testerman.

FOR THE COMMANDER:

3 Incl
as

/s/Sidney Wise
/t/SIDNEY WISE
C, Meth Imprv Div
Analysis Directorate

METHODOLOGY INVESTIGATION PROPOSAL

1. TITLE. Environmental Issues Guide for Humid Tropic Testing (EIGHT)
2. CATEGORY. Test Tasking Document Preparation
3. INSTALLATION. US Army Tropic Test Center
ATTN: STETC-MTD
APO Miami 34004
4. PRINCIPAL INVESTIGATOR. G. K. A. Coleman
STETC-MTD-AB
Autovon 313-285-5412
5. STATEMENT OF THE PROBLEM. Customer identification of all relevant climatic issues in IEPs/TDPs or at IPRs/TIWGs does not exist because a systematic approach for this purpose is lacking. Project officers must identify all factors that may degrade specific system applications. A procedure is needed to integrate system analysis, operations research, and environmental testing experience into materiel system test designs so that TECOM field and chamber testing facilities will be used to their fullest extent.
6. BACKGROUND. Upon occasion test planners have failed to identify significant environmental test issues. The result is a test that does not assess those issues, causing either supplementary tests at later dates, or no testing for those important issues. Neither result is appropriate. Use of a document that identifies salient tropic climatic testing issues will help to insure more effective tropic materiel tests and more effective fielded systems.
7. GOALS.
 - a. To develop an Environmental Issues Guide for Humid Tropic Testing (EIGHT) identifying salient climatic issues to be considered in IEPs/TDPs or at TIWGs and IPRs.
 - b. To prepare a test operations procedure (TOP) to be used when preparing IEPs/TDPs.
 - c. To devise an overall framework that will help to identify areas of needed test methodology development and necessary tropic research.
8. DESCRIPTION.
 - a. The USATTC bank of scientist and test officer expertise will be surveyed to identify commodities and relevant environmental parameters for tropic testing. A "Commodity Area X Environmental Area" matrix will be developed from that survey.

b. The Delphi analysis technique will be applied throughout TECOM to assess the impact of various aspects of the tropic environment on specific types of commodity. Although environmental experts from other centers will be consulted to determine which tropic environmental issues should be addresses for specific commodity types, emphasis will be placed upon the Delphi results obtained from TECOM Environmental Technical Committee members.

c. A survey of the literature will be made to include all relevant commodity and environmental parameters.

d. EIGHT Development:

(1) Interim Guide (short-term)--Initial Iteration

(a) Classify each cell to indicate if the environment/commodity combination is an issue for tropic testing.

(b) For each cell identified as an issue for tropic testing, list or explain briefly the degrading effect that the scientific environmental factor is expected to have on the specific commodity.

(c) Develop a "quick guide" based on the above.

(2) Complete Guide (long-term)--Final Iteration

(a) For each cell of the matrix identified as an issue for tropic testing, scientifically document the nature of the effect.

(b) Scientifically document the nature of the environmentally related cause.

(c) Formulate issue statements based on the above documented cause and effect relationships. Issue statements tailored to specific testing stages (DT-I, DT-II, DT-III) will be more useful to IEP/TDP writers and TIWG/IPR attendees than the present method.

(d) Prepare final draft of complete issues guide. This guide will help validate or change existing MIL-STD-810 methods. It may identify other environmental effects for which chamber tests may be feasible.

e. Health Hazard Assessment

Participants will be within normal duty limits under conditions in which neither informed participation nor volunteer participation is required. Similar activities in the past have not revealed any health hazard. No health hazard has been identified in this MIP.

9. PROGRESS. This is a new investigation.

10. JUSTIFICATION.

a. Problem. Without the EIGHT, customers and test planners will continue to fail to identify relevant environmental issues for development tests. Either a relevant commodity parameter will not be evaluated or supplemental tests will be required. Either result provides less effective testing, with concomitant loss in tactical system operational capability for the US Army.

b. Dollar Savings. When available, the proposed guide will have an impact on every development test conducted at USATTC. Savings cannot be estimated at this time. However, tactical system effectiveness after testing will have improved reliability, with greater ability of US Forces to fight and survive.

c. Workload. As indicated in paragraph 10a, the development of the EIGHT would have an impact on every development test (DT) conducted at USATTC. In the last 3 years, USATTC has completed an average of 21 tests per year. In FY80, no DT-I, 19 DT-II, and no DT-III tests have been scheduled. To date, 2 DT-II tests have been completed. It is anticipated that the number of tests in the next 3 years will increase.

d. Recommended TRMS Priority: 1

e. Association with Requirements Documents. Not applicable.

f. Other. This investigation is being conducted to provide an environmental issue identification guide. This does not now exist for tropic testing or for any other category of environmental field testing.

11. Resources.

a. Financial.

(1) Funding Breakdown:

| | Dollars (thousands) | | | |
|-----------------------------|----------------------------|--------------------------------|----------------------------|--------------------------------|
| | FY81 | | FY81 | |
| | <u>In-</u> <u>House</u> | <u>Out-of-</u> <u>House</u> | <u>In-</u> <u>House</u> | <u>Out-of-</u> <u>House</u> |
| Personnel Compensation | - | - | - | - |
| Travel | 2 | - | 2 | - |
| Contractual Support | - | 4 | - | 10 |
| Consultant & Other Services | - | 4 | - | 15 |
| Materials & Supplies | <u>2</u> | <u>-</u> | <u>2</u> | <u>-</u> |
| FY TOTAL | 4 | 8 | 4 | 25 |

(2) Explanation of Cost Categories:

(a) Personal Compensation: Not applicable.

(b) Travel: Coordination of criteria/issue identification with TECOM and other centers.

(c) Contractual Support: Collect/analyze data needed to formulate cause/effect statements.

(d) Consultants: To help formulate matrix and cause/effect statements.

(e) Materials and Supplies: Not applicable.

(f) Equipment: Not applicable.

b. Anticipated Delays. The investigation cannot be completed until scientists and engineers coordinate criteria/issue selection with HQ TECOM.

c. Obligation Plan.

| FY81 | FQ | 1 | 2 | 3 | 4 |
|----------|----|---|---|---|---|
| Rate (K) | | 3 | 3 | 3 | 3 |

d. In-House Personnel.

| | No. | FY81 Man-Hours | | Study Hours Required |
|--|-----|-------------------|-----------|-------------------------|
| | | Required | Available | |
| Phy Sci Admin, GS 1303 | 1 | 200 | 200 | |
| Opns Rsch Anal, GS 1515 | 1 | 600 | 600 | |
| Materials Eng, GS 806 | 1 | 160 | 160 | |
| Elec Engr, GS 855 | 1 | 160 | 160 | |
| Research Psychologist, GS 180 | 1 | 80 | 80 | |
| Math Stat, GS 1529 | 1 | 160 | 160 | |
| Chemist, GS 1320 | 1 | 80 | 80 | |
| Gen Engr, GS 801 | 1 | 80 | 80 | |
| Engineering Tech, GS 802 | 1 | 80 | 80 | |
| Elec Tech, GS 856 | 1 | 300 | 300 | |
| Microbiologist, GS 401 (Vacant Position) | | 80 | 0 | |
| Total | | 1,980 | 1,900 | 1,500 |

12. INVESTIGATION SCHEDULE.

| | FY81 | | | | | | | | | | | | FY82 | | | | | | | | | | | |
|----------|------|---|---|---|---|---|---|---|---|---|---|---|------|---|---|---|---|---|---|---|---|---|---|---|
| | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S |
| In-House | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | R |
| Contract | | | | | | | | | | | | | A | . | . | . | . | . | . | . | . | . | . | . |

LEGEND:

- - - Active investigation work
- . . . Contract monitoring
- A Award of contract
- R Final report due at HQ, TECOM

13. ASSOCIATION WITH TOP PROGRAM. This proposal contemplates a new TOP.

FRANK S. MENDEZ
Chief, Materiel Test Division

(END COPY)

APPENDIX B. REFERENCES

1. Letter, STETC-MTD-A to US Army Engineer Topographic Laboratories, subject: Environmental Issues Guide Concept Paper, 2 February 1981.
2. Army Environmental Sciences; Volume 1, Number 2, page 17; US Army Corps of Engineers, September 1982.
3. Informal draft AMSAA Discussion Paper, "Stratification of the Geophysical Elements of Terrestrial Combat," compiled by John Kramer, US Army Materiel Systems Analysis Activity, 11 December 1977.

APPENDIX C. DISTRIBUTION LIST

ENVIRONMENTAL ISSUES GUIDE FOR HUMID TROPIC TESTING (EIGHT)
TECOM PROJECT NO. 7-CO-PB1-TT1-001

| <u>Addressee</u> | <u>Final Report</u> |
|---|----------------------------|
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| Commander US Army Aberdeen Proving Ground ATTN: STEAP-MT-S Aberdeen Proving Ground, MD 21005 | 1 |
| Commander US Army Test and Evaluation Command ATTN: DRSTE-CT-T DRSTE-CT-A DRSTE-AD-M DRSTE-AD-R DRSTE-TO-F DRSTE-TO-I Aberdeen Proving Ground, MD 21005 | 1 1 1 1 1 1 |
| Director US Army Human Engineering Laboratory ATTN: DRXHE-FS Aberdeen Proving Ground, MD 21005 | 1 |
| Director US Army Materiel Systems Analysis Activity ATTN: DRXSY-R DRXSY-MP Aberdeen Proving Ground, MD 21005 | 1 1 |
| TRADOC Liaison Officer US Army Test and Evaluation Command Aberdeen Proving Ground, MD 21005 | 1 |
| Commander US Army Aviation Research and Development Command ATTN: DRDAV-DI 4300 Goodfellow Boulevard St. Louis, MO 63120 | 4 |

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| US Army Human Engineering Laboratory Liaison Officer ATTN: DRXHE-AV 4300 Goodfellow Boulevard St. Louis, MO 63120 | 1 |
| Commander US Army Aviation Research and Development Command ATTN: DRDAV-EGG St. Louis, MO 63166 | 1 |
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| Commander US Army White Sands Missile Range ATTN: STEWS-TE-P White Sands Missile Range, NM 84022 | 1 |
| Commander US Army TRADOC Combined Arms Test Activity ATTN: ATCT-MA Fort Hood, TX 76544 | 1 |
| Commander US Army Dugway Proving Ground ATTN: STEDP-MT-DA-T Dugway, UT 84022 | 1 |
| Commander US Army Operations Test and Evaluation Agency ATTN: CSTE-P00 5600 Columbia Pike Falls Church, VA 22041 | 2 |
| Commander US Army Engineer Topographic Laboratories ATTN: ETL-GS-LB Fort Belvoir, VA 22060 | 1 |

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| Administrator Defense Technical Information Center ATTN: DDA Cameron Station Alexandria, VA 22314 | 2 |
| Chief Battlefield Electromagnetic Environments Office US Army Materiel Development and Readiness Command 5001 Eisenhower Avenue Alexandria, VA 22333 | 1 |
| Commander US Army Materiel Development and Readiness Command ATTN: DRCQA-S DRCSM-ID DRCDE-S DRCDE-PIP DRCDF 5001 Eisenhower Avenue Alexandria, VA 22333 | 1 1 1 1 1 |
| Commander US Army Training and Doctrine Command ATTN: ATTE-R ATCD-ET ATCD-N Fort Monroe, VA 23651 | 1 1 1 |
| Commander US Army Cold Regions Test Center ATTN: STECR-OP-PM STECR-MT APO Seattle 98733 | 1 1 |

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Final
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US Army Tropic Test Center
ATTN: STETC-MTD-T
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